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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
PTO/SB/05 (4/98)

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	PD990062
First Inventor or Application Identifier	Marco Winter, et al.
Title	Method for Coding a Picture Sequence*
Express Mail Label No.	EL479513570US

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)

2. [X] Specification [Total Pages 26]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. [X] Drawing(s) (35 U.S.C. 113) [Total Sheets 6]

4. Oath or Declaration [Total Pages 1]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d))
   (for continuation/divisional with Box 16 completed)
      i. [ ] DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

5. [ ] Microfiche Computer Program (Appendix)

6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [X] Assignment Papers (cover sheet & document(s))

8. [ ] 37 C.F.R. §3.73(b) Statement (when there is an assignee) [X] Power of Attorney

9. [ ] English Translation Document (if applicable)

10. [X] Information Disclosure Statement (IDS)/PTO-1449 [5] Copies of IDS Citations

11. [X] Preliminary Amendment

12. [X] Return Receipt Postcard (MPEP 503) (Should be specifically itemized)

13. [ ] * Small Entity Statement(s) (PTO/SB/09-12) [ ] Statement filed in prior application. Status still proper and desired

14. [ ] Certified Copy of Priority Document(s) (if foreign priority is claimed)

15. [ ] Other: Search Report

16. If a **CONTINUING APPLICATION**, check appropriate box, and supply the requisite information below and in a preliminary amendment:
[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____
Prior application information: Examiner _____ Group / Art Unit: _____

For **CONTINUATION or DIVISIONAL APPS only**: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation **can only** be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[ ] Customer Number or Bar Code Label
(Insert Customer No. or Attach bar code label here)
or [ ] Correspondence address below

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Name (Print/Type)	Francis A. Davenport	Registration No. (Attorney/Agent)	36,316
Signature	*Francis A. Davenport* (signature)	Date	October 18 2000

*as well as a Sub-Picture Unit for Use in an Electronic Appliance and a Data Storage Medium

EXPRESS MAIL LABEL: EL479513570US

FEE TRANSMITTAL
for FY 2000

Patent fees are subject to annual revision
Small Entity payments **must** be supported by a small entity statement,
otherwise large entity fees must be paid. See Forms PTO/SB/09-12
See 37 C F R §§ 1 27 and 1 28

Complete if Known	
Application Number	
Filing Date	HEREWITH
First Named Inventor	M. Winter & H. Schiller
Examiner Name	
Group / Art Unit	
Attorney Docket No	PD990062

TOTAL AMOUNT OF PAYMENT ($) 906

METHOD OF PAYMENT (check one)

1. [X] The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number: 07-0832

Deposit Account Name: THOMSON multimedia Licensing Inc.

[X] Charge Any Additional Fee Required Under 37 CFR §§ 1 16 and 1 17

2. [ ] Payment Enclosed:
[ ] Check [ ] Money Order [ ] Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee ($)	Fee Code	Fee ($)		
101	690	201	345	Utility filing fee	710
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 710

2. EXTRA CLAIM FEES

	Extra Claims	Fee from below	Fee Paid
Total Claims	16 -20** =	X	
Independent Claims	5 - 3** = 2	X 78	156
Multiple Dependent			

**or number previously paid, if greater; For Reissues, see below

Large Entity		Small Entity		Fee Description
Fee Code	Fee ($)	Fee Code	Fee ($)	
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 156

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee ($)	Fee Code	Fee ($)		
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	380	216	190	Extension for reply within second month	
117	870	217	435	Extension for reply within third month	
118	1,360	218	680	Extension for reply within fourth month	
128	1,850	228	925	Extension for reply within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40
146	690	246	345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	690	249	345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40

SUBMITTED BY

	Complete (if applicable)	
Name (Print/Type): Francis A. Davenport	Registration No. (Attorney/Agent): 36,316	Telephone: 609-734-9864
Signature: *[signature]*		Date: October 18 2000

WARNING:

Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Marco Winter and Harald Schiller

Filed: Herewith

For: Method for Coding a Picture Sequence as well
                   As a Sub-Picture Unit for Use in an Electronic
                   Appliance and a Data Storage Medium

PRELIMINARY AMENDMENT

Hon. Commissioner for Patents
Washington, D.C. 20231

Sir:

   Please amend the above identified application as follows.

IN THE SPECIFICATION

Page 1, line 1   delete "Title of the Invention".

Page 1, line 2   delete "Method for coding a picture sequence, as well as a
sub-picture unit for use in an electronic appliance, and a data storage medium"

      and replace with,

            --Coding method for picture sequence or sub-picture unit--.

Page 3, line 20   delete "The said object is achieved by the features of the independent
Claim 1. The construction of a corresponding sub-picture data unit is specified in the
independent Claim 8."

Page 4, line 27   delete "The measures specified in the dependent claims allow
advantageous developments and improvements of the method specified in Claim 1."

Page 23, line 1   delete "Claims" and replace with
                                 --What is claimed is.—

Page 26, line 23   delete "Figure 3"

IN THE CLAIMS:

Cancel claim 1 without prejudice.

1   2. (Amended) Method according to Claim [1] 15, wherein the size of the segments (30)
2   corresponds to the size of the object details to be displayed.

1   3. (Amended) Method according to Claim [1] 15, wherein the two respective adjacent
2   segments are shifted through two pixels in the vertical direction with respect to one another
3   before they are combined.

1   4. (Amended) Method according to Claim [1] 15, wherein the two respective adjacent
2   segments are shifted through one pixel in the vertical direction with respect to one another
3   before they are combined.

1   5. (Amended) Method according to Claim [1] 15, wherein a combined picture piece is
2   moved with respect to the previous and the next picture piece through the number of pixels
3   through which the object is moved per picture in the horizontal direction.

1   6. (Amended) Method according to Claim [1] 15, wherein the pixels of the pictures can
2   assume only two values, referred to in the following text as the "on" and "off" values.

1   7. (Amended) Method according to Claim [1] 15, wherein the following four different pixel
2   types are provided:
3   -   if the corresponding pixels both have the value "off", then the combined
4   pixel value is allocated the type A;
5   -   if the corresponding pixels both have the value "on", then the combined
6   pixel value is allocated the type B;
7   -   if the pixel in the first picture segment has the value "on" and the pixel in the
8   second of the picture segments to be combined has the value "off", then the combined pixel
9   value is allocated the type C;
10   -   if the pixel in the first of the two picture segments to be combined has the
11 value "off" and the pixel in the second of the two picture segments to be combined has the
12 value "on", then the combined pixel value is allocated the type D

1   8. (Amended) Method according to Claim [1] 15, wherein the picture segments to be
2   combined are combined such that they only partially overlap, and missing pixels outside the
3   overlapping area are assigned the value "off".

ADD THE FOLLOWING

1 --15   A method for coding a picture sequence for horizontal motion on a display screen,
2 said method comprising the steps of:
3   dividing said picture into a number of segments of equal size by means of vertical
4 cuts;
5   combining pixel data of two respective adjacent segments, with a combined pixel
6 being produced in each case from corresponding pixels in the segments to be combined;
7   assigning a unique type to said combined pixels which corresponds to the
8 distribution of the pixel values in the pair of corresponding pixels; and,
9   defining a number of combined pixels in each line of said picture are in each case
10 separately run-length coded, said defined number of combined pixels corresponding to the
11 number of pixels through which the picture is moved per movement step in the horizontal
12 direction.

1 16.   A disk medium having recorded thereon a DVD compatible signal including coded
2 signals representative of sub-pictures and including data for controlling the decoding and
3 display thereof, DVD compatible signal comprising;
4   a sub picture sequence having a data area for pixel values of said sub pictures of said
5 sequence; and,
6   an instruction area having control instructions for display of said sub picture
7 sequence, said control instruction sequences including an address pointer for starting run-
8 length decoding, wherein successive pointer addresses start run-length decoding at
9 predetermined different pixels values in the sub picture to cause a predetermined motion and
10 direction of the sub picture formed within a display picture.

1 17.   The disk medium of claim 16, wherein said display control instruction sequences
2 additionally includes an instruction defining processing of combined pixels of a combined
3 picture piece.--

REMARKS

Pages 1, 3, 4, 7, 12, 23 and 26 of the application have been amended to correct typographical errors and to meet the requirements of the U.S. Patent Office.
No new matter has been added.
Claim 1 is cancelled without prejudice. Claims 2, 3, 4, 5, 6, 7 and 8 are amended as indicated above to correct pendancy. New claims 15, 16 and 17 have been added. No new matter has been added.

Respectfully submitted,

Marco Winter, et al.

19 October, 2000   By: *Francis A. Davenport*

Francis A. Davenport
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(609)-734-9864

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PD990062-Sj-041000

<u>Title of the Invention</u>
Method for coding a picture sequence, as well as a sub-picture unit for use in an electronic appliance, and a data storage medium

5

<u>Background of the Invention</u>
The invention relates both to a method for coding a picture sequence and, furthermore, to a corresponding sub-picture data unit for use in an

10   electronic appliance. In addition, the invention relates to a data storage medium, on which a sub-picture data unit according to the invention is stored.

Various picture coding methods are known from

15   video technology. The method proposed here for coding of a picture sequence is based on a picture coding method which is used for producing so-called sub-picture data units for DVD appliances. Such DVD appliances are already commercially available and each

20   contain a sub-picture decoding device (or sub-picture decoder) which can process the said sub-picture data units. A description of the picture coding method used there can be found, for example, in the DVD Standard "DVD Specification for read-only disc", part 3, video

25   specification, Version 1.0, August 1996, Section 5.4.3 Sub-picture unit (SPU). A detailed description of the said sub-picture decoder devices can be found, for example, in EP-A-0 725 541.
According to the DVD Standard, the main

30   application for sub-picture data units is, for example, the generation of subtitles on a television screen. The subtitles can then be overlaid anywhere in the picture, and they are generally overlaid at the lower edge of the picture. The bitmap data for in each case one

35   subtitle are then stored in the sub-picture data unit SPU. In order to define the location of a subtitle on the screen, and to define a number of display characteristics, in particular the colour, transparency etc., simple graphics control instructions are

specified in the said DVD Standard. Thus, with skilful programming, sub-picture data units can in principle also be used for other purposes, for example for control instructions, operator guidance menus,
5 animation pictures and screen savers etc.

The essential parts of a sub-picture data unit according to the DVD Standard comprise a data field for the bitmap data of the text to be displayed or, in more general form, the object to be displayed, as well as a
10 second part in which so-called display control instruction sequences are stored, which define the display location, the display time and the display characteristics of the stored object. Furthermore, a number of objects can also be stored successively in
15 the data field for the bitmap data, and can each be called up at different times. If a number of objects are intended to be provided in a sub-picture data unit, then the DVD Standard specifies that a corresponding area must in each case be provided in the bitmap data
20 field for each object. The bitmap data are then still run-length coded in order to achieve picture compression and to save memory space. While precautions are already taken in the said DVD Standard, as to how a text can be run through in the vertical direction in
25 the overlaid sub-picture window using the existing display control instruction set, there is no information as to how it is possible to allow a text to be run through in the horizontal direction in the sub-picture window. Running through a text in the
30 horizontal direction is often also referred to as running script, and can frequently be seen in some television programmes. One example which may be mentioned is the process of continuously running through stock market figures by television programme
35 providers such as NTV.

Persons skilled in the art will very soon have the capability to use such running scripts in DVD appliances as well, utilizing the specified sub-picture data units, such that either a separate sub-picture

data unit is stored for each individual frame of such a running script, or a sub-picture data unit would have to be provided for a number of phases of the running script, containing a correspondingly large number of

5　bitmaps for the individual phases of the movement, which are then called up individually. As can be seen, these solutions are very memory-intensive. In any case, owing to the limitation in size of sub-picture data units to 53220 bytes, the second solution is feasible

10　only for relatively short running scripts.

Summary of the Invention

One object of the invention is to specify a method for coding a picture sequence which, based on

15　the display control instructions which have already been defined in the DVD Standard, and based on the rules for constructing sub-picture data units, allows horizontal movement of an object to be provided in the sub-picture display window while using the memory

20　efficiently. The said object is achieved by the features of the independent Claim 1. The construction of a corresponding sub-picture data unit is specified in the independent Claim 8.

In the method according to the invention for

25　coding a picture sequence, the object picture is broken down into a number of segments of equal size by means of vertical cuts. The pixel data of two respective adjacent segments are then combined, with a combined pixel being produced in each case from corresponding

30　pixels in the parts to be combined, in such a way that the combined pixel is assigned a unique type, which corresponds to the distribution of the pixel values in the pair of corresponding pixels. In addition, such combined picture pieces are run-length coded section by

35　section. This is done in such a way that a separate run-length coding is carried out in each case for the combined pixels in a section of running script/object. The size of the detail in this case corresponds to the number of pixels through which it is intended to move

the object in the horizontal direction in each movement
phase. That is to say, for example, if it is intended
to move the object through 8 pixels from right to left
in each movement phase, a separate run-length coding
5 must in each case be carried out for each 8 pixels for
all the lines of the object detail. By appropriately
placing a pointer on the respective object detail, it
is then a simple matter during the decoding of the
picture sequence to produce a picture sequence which,
10 when output, gives the viewer the impression of a
horizontal movement of the object relative to the
window, in a window on a display appliance. This
specific type of combined coding of adjacent segments
of the object picture, and the specific type of run-
15 length coding, allow the memory requirement for the
resultant sub-picture data unit to be considerably
reduced. Specifically, there is no longer any need to
provide a dedicated bitmap for each phase of the
movement, but only a considerably smaller number, with
20 there being approximately as many bitmaps as the number
of segments which are also produced by vertical cuts.
Although this may result in somewhat more run-length
code words in the combined object picture parts, the
reduction in the bitmap areas required is, however,
25 considerable, so that considerably less memory space is
required in any case.

The measures specified in the dependent claims
allow advantageous developments and improvements of the
method specified in Claim 1.

30 The measure according to which the size of the
object segments corresponds to the size of the object
details to be displayed is an optimization process, by
means of which the number of segments is limited to a
small amount.

35 The measure according to which two picture
parts to be combined are initially shifted through two
pixels in the vertical direction with respect to one
another before they are combined ensures that the
correct pixels are always joined together seamlessly

when, after moving the pointer for the start of the run-length decoding in a line, pixels in the lower and upper of the two combined picture pieces follow one another. The picture quality is thus optimized.

5   The measure according to which a combined picture piece is moved with respect to the previous and next combined picture piece through the number of pixels through which the object is moved in each step in the horizontal direction results in the advantage of

10   a further reduction in the memory required. Specifically, this is due to the fact that the redundant positions in the individual bitmap areas are in this way eliminated.

        A sub-picture data unit according to the

15   invention for use in an electronic appliance which contains a coded picture sequence which has been coded in accordance with the method according to the invention for coding of a picture sequence has the fundamental structure such that it contains a data area

20   for the pixel values of the individual pictures in the picture sequence, and an instruction area for display control instruction sequences. The invention then provides that display control instruction sequences are provided for producing the horizontal movement of the

25   object and each contain one instruction, by means of which the start of the run-length decoding for a picture is in each case moved by a number of pixels corresponding to the desired movement of the object. The display control instruction SET_DSPXA defined in

30   the DVD Standard can advantageously be used for this purpose. An instruction which defines the way in which the combined pixels are to be evaluated is likewise provided in each of the display control instruction sequences for reproduction of a picture.

35   In the case of DVD sub-picture data units, the instructions SET_CONTR or CHG_COLCON defined in the DVD Standard can be used for this purpose.

Finally, the invention covers a data storage medium, in particular a DVD disk, which contains a sub-picture data unit stored according to the invention.

5 Brief Description of the Drawing

Exemplary embodiments of the invention will be explained in more detail in the following description and are illustrated in the drawings, in which:

Figure 1   shows a DVD player and a television set which
10   is connected to it and is displaying an overlaid running script;

Figure 2   shows an example of the known frame format for the data in the sub-picture data unit;

Figure 3   shows an illustration to explain how two
15   object picture sections are combined with one another;

Figure 4   shows a run-length coded line of an object picture detail;

Figure 5   shows an illustration of how the SET_DSPXA
20   instruction in the display control instruction sequences points to the first run-length code word of different details;

Figure 6   shows the combination of two picture details for the example of a sub-picture data unit as
25   shown in Figure 7;

Figure 7   shows a simple example of a sub-picture data unit according to the invention;

Figure 8   shows the combination of picture pieces of a running script according to a first exemplary
30   embodiment;

Figure 9   shows the combination of picture pieces of a running script according to a second exemplary embodiment of the invention;

Figure 10 shows an illustration to explain the
35   different memory size which is required for the types of combination shown in Figures 8 and 9, and

Figure 11 shows an illustration to explain how additional memory space can be saved by

skilful coding of the last lines of a running
script.

Description of the Preffered Embodiments

5   The invention will be explained using the
example of a DVD appliance. In Figure 1, reference
number 10 denotes a conventional TV set. A DVD player
is denoted by the reference number 11. This DVD player
is connected to the TV set 10, for example via a Scart
10   cable. The DVD player 11 produces the analogue
television signal, which is fed to the TV set. The
reference number 12 denotes a display window, in which
a running script is overlaid. The running script can
move either from left to right in the display window 12
15   or, conversely, from right to left. The dashed
illustration indicates that the running script is in
each case displayed only section by section in the
display window. The entire running script is in this
case displayed such that it is actually so long that it
20   could not be displayed completely on the screen.
According to the DVD Standard, a subtitle is mainly
overlaid on the television picture in a display window
12. One sub-picture data unit (SPU) is in each case
used for each subtitle for this purpose.
25   Figure 2 shows the known data format of a
picture data unit in rough outline. The reference
number 20 denotes a data field for a header part (SPUH)
of the sub-picture data unit. The reference number 21
denotes a data field for the compressed pixel data
30   (PXD) of the sub-picture. The reference number 22 also
denotes a data field for a display control instruction
sequence table (SP_DCSQT). So-called display control
instruction sequences (SP_DCSQ) are stored in the data
field 22. The terms which have been mentioned as well
35   as the various display control instructions are defined
in the DVD Standard (Version 1.0) mentioned initially,
so that the details do not all need to be explained for
the disclosure of the invention. However, reference is

expressly made to this publication with regard to the disclosure of the invention.

The pixel data in the data field 21 govern the displayed pattern of the displayed sub-picture. For each pixel in a line of the sub-picture, a 2-bit long data word is used to indicate whether this is a background pixel, a foreground pixel (pattern pixel) or whether the pixel must be emphasised in a first way (emphasis-1 pixel) or in a second way (emphasis-2 pixel). These four differences can be defined by two bits. In this case, in detail, the binary value meanings are as follows:

00 = background pixel
01 = foreground pixel
10 = pixel displayed with emphasis 1
11 = pixel displayed with emphasis 2

It must be remembered in this case that the individual pixel data items are not stored in this raw form in the memory, but are stored in compressed form. Run-length coding is carried out for this purpose. The run-length coding method is likewise explained in very great detail in the said DVD Standard (1.0). The said DVD Standard defines 7 coding rules for run-length coding. In this case, the run-length coding works in such a way that one line of a field of the sub-picture to be displayed is run-length coded in each case. The individual rules will not be explained in any more detail here, however, since these are known sufficiently well from the said DVD Standard. Run-length coding achieves a relatively large amount of compression for simple picture contents.

The method according to the invention for coding a picture sequence will be explained in the following text using the example of a running script. The method according to the invention can be used, of course, not only to produce a running script but also, instead of this, to display any desired other object

section by section in a window, so that it will be possible to identify a relative movement between the object and the window in the horizontal direction in that window. First of all, the object, that is to say

5   the entire running script in this example, is broken down by vertical cuts. Each part is in this case chosen to be of the same size. The size of a part also corresponds to the size of the display window in which it is intended that the running script will later be

10 overlaid. This applies in particular to the extent of each part in the horizontal direction. Once the running script has been broken down into segments, two adjacent segments are then in each case combined with one another. This process is also illustrated in more

15 detail in Figure 10. It can be seen in the upper part of Figure 10 that a running script has been broken down into nine segments, with the ninth segment no longer being of the same size as the previous segments and, for this reason, being artificially enlarged by being

20 filled with background pixels so that a segment of the same size is likewise once again produced. The first two picture segments are then combined with one another. This results in the combined picture piece K1. Next, the second and third segments are then combined

25 with one another, producing the combination K2. Once again, the third and fourth segments are then combined with one another. This results in the combination K3 etc., until, finally, the eighth and ninth segments of the running script are combined with one another as the

30 last combination K8.

Two object picture segments are in this case combined as shown in Figure 3. In Figure 3, one picture segment in this case contains the letter H, and the other picture segment contains the letter A. These

35 letters are then intended to be written one behind the other in the running script. The two picture parts to be combined are shown one above the other in the left-hand part of Figure 3. The pixels of the letter are each marked by *, and the pixels of the background of

the respective picture segment are marked by single dots. Thus, in this case, it is assumed that a pixel can assume only two values, namely simply whether the pixel is stimulated to illuminate, which corresponds to the "on" state, or not, which corresponds to the "off" state. The two illustrated picture parts each comprise 9 x 8 pixels. When these picture pieces are combined, this can be thought of as placing one piece over the other, so that the picture elements are superimposed. In the illustrated example, the two picture pieces are not placed one on top of the other such that they match, but are shifted through two pixels with respect to one another in the vertical direction. This is necessary to ensure that they are output in the correct lines when the combined picture pieces are subsequently decoded, and this will be explained in more detail in the following text. The shifting of the picture sections one above the other is indicated by dashes in Figure 3. The pixels which have been placed one on top of the other are then combined in accordance with the following rules:

If the pixels to be combined are both in the "off" state, then the combined pixel at this position in the combined picture piece is assigned the pixel type A. If the pixels to be combined both have the value "on", then the combined pixel for this position is assigned pixel type D.

If the lower pixel has the value "on" and the pixel located above it has the value "off", then the pixel at this position in the combined picture piece is declared with the pixel type C. If the value of the lower pixel is "off" and that of the pixel located above is "on", then the combined pixel is assigned pixel type D. The result of this pixel combination is shown in the top right of Figure 3.

The lower part of Figure 3 then shows how the four pixel types A-D are allocated to the pixel types "background" b, "pattern" p, "emphasis 1" and "emphasis 2" defined in the DVD Standard. Pixel type A becomes a

"background pixel", pixel type B becomes a "pattern pixel", pixel type C becomes an "emphasis-1 pixel" and pixel type D becomes an "emphasis-2 pixel". The corresponding pixel types are shown at the bottom of Figure 3. This allocation process should be regarded only as an example for the purposes of the invention. 4! = 24 different allocations are possible in terms of possible permutations of the four pixel types.

The picture piece combined in this way is thus complete and is then also run-length coded in order to produce a sub-picture data unit that complies with the DVD Standard. However, according to the invention, the run-length coding is not carried out to optimize the memory requirement for a complete line of the combined picture piece, but is processed using a specific type of run-length coding, which will be explained in more detail with reference to Figure 4.

Figure 4 shows an example of a line of a combined picture piece. The lower part of Figure 4 shows the run-length code words for the illustrated line in the situation where the run-length coding is optimized for the memory requirement. As can be seen, a run-length code word is in each case formed per number of pixels of the same type (B or P). However, according to the invention, separate run-length coding is now always carried out for eight successive pixels, instead of this. The dashed lines in the upper part of Figure 4 each form the boundary between a section of eight successive pixels. The first section shown contains only type b pixels. The hexadecimal number 20H is accordingly formed as the run-length code word. This is followed in the second section by another two type b pixels followed by six type p pixels. Two run-length code words are therefore formed here. Firstly 44H for the two type b pixels, and 19H for the six successive type p pixels. This is followed in the third section by four type p pixels and then four type b pixels. The associated run-length code words are 11H and 10H. Thus, on the basis of this method according to the invention,

separate run-length coding is carried out for a specific number of pixels. In the illustrated example, separate run-length coding has been carried out for each eight pixels, since the example is constructed
5   such that the running script is intended to move onwards by eight pixels in the horizontal direction from step to step. If even finer resolution of the movement is required in another example, for example with only four pixels per step, then run-length code
10   words would each have to be calculated separately for four pixels in each line. A step can in this case be carried out for each new video frame, or else only for every N frames where N = 1, 2, 3, 4, ...

The DVD Standard which has been mentioned
15   defines a display control instruction using which it is possible to predetermine the memory address at which the run-length decoding is intended to start for the sub-picture to be displayed. This instruction is the SET_DSPXA instruction. This is the instruction which is
20   used to produce the horizontal movement, for example the running script, in a sub-picture data unit according to the invention. Namely, a specific display control instruction sequence SP_DCSQ is then provided for each movement step in a sub-picture data unit
25   according to the invention. Each of these display control instruction sequences in this case uses the SET_DSPXA instruction to shift the PXD pointer for the start of the run-length decoding in such a way that the run-length decoding starts K pixels further to the
30   right in the bitmap, with K being the number of pixels through which the running script is intended to move horizontally per step. This is symbolized by arrows in Figure 5. In the example shown in Figure 5, K is equal to the number 8. In the first display control
35   instruction sequence, the SET_DSPXA instruction points to the run-length code word 20H. In the next display control instruction sequence, the instruction points to the run-length code word 44H, and in the next display control instruction sequence it points to the run-

length code word 11H, etc. The run-length decoding thus
always starts further to the right in the line being
displayed. Different pixels from the running script are
thus always displayed in succession.

5   Figures 6 and 7 show an example of a sub-
picture data unit according to the invention for a DVD
player. The letters A, B, C, D, E, F are stored as a
single combined picture piece in the bitmap of the sub-
picture data unit shown in Figure 7. The type of
10 combination is in this case shown in Figure 6. The
left-hand part of Figure 6 shows the pixel pattern for
displaying the letters A, B, C. The background pixels
are in this case marked by a single dot, and the pixels
which produce the pattern of the letters are marked by
15 a vertical line. In a corresponding way, the centre
part of Figure 6 shows the pixel pattern for the
letters D, E, F. The background pixels are likewise
marked by single dots in this case, and the pixels for
producing the letter pattern are in this case marked by
20 a horizontal line. The shifting of the two parts with
respect to one another through two pixels in the
vertical direction can also be seen. If the two picture
parts are placed one on top of the other, then this
results in the pixel pattern as shown in the right-hand
25 part of Figure 6. The single dots mark the pixel type
where the two corresponding pixels are background
pixels. The vertical line marks the pixel type where
the lower pixel is switched on and the upper pixel is
switched off. Horizontal lines mark the pixels where
30 the lower pixel is switched off and the corresponding
upper pixel is switched on. In addition, stars mark the
pixels where the upper and lower pixels are both
switched on.
        The run-length code words for this combined
35 picture piece are stored in the PXD data field of the
sub-picture data unit. In this example, the run-length
code words have each been determined separately for two
successive pixels. When this sub-picture data unit is
being decoded, this then results in a slow movement of

the text from right to left at two pixels per step. It must also be remembered that different bitmap areas are stored in the PXD field of the sub-picture data unit shown in Figure 7 for the first and second fields of a

5 video frame. The run-length code words for the lines 1, 3, 5, 7, 9 and 11 are thus stored in the first field, and the run-length code words for the even-numbered lines are stored in the bitmap for the second field. The run-length code words for the combined picture

10 piece for the first field are located in the memory starting at the address 0004H:. Figure 7 shows the hexadecimal addresses without the addition of the letter H. The run-length code words for the second field are located in the memory starting at the address

15 0033H:. The PXD area is filled with zero byte entries starting at the address 0060H: in order to satisfy the rule specified in the DVD Standard that the PXD area, including the SPU header area, which has a size of 4 bytes, must not be less than half the total SPU size.

20 The PXD area is followed by the area with the display control instruction sequences. This area is also referred to as the display control instruction sequence table SP_DCSQT. The following process now takes place in the first display control instruction sequence

25 SP_DCSQO: the SP_DCSQ_STM instruction is used to indicate that the display of the picture is intended to start directly when the sub-picture data unit SPU is called up. The next display control instruction SP_NXT_DCSQ_SA indicates where the next display control

30 instruction sequence SP_DCSQ1 is stored. The next display control instruction SET_DSPXA now stipulates that the run-length decoding for the first field is intended to start at the address 004FH:, and the decoding for the second field is intended to start at

35 the address 0033H:. The display control instruction SET_COLOR after this stipulates that all the pixels of pixel types b and p are regarded as background, and are intended to be displayed using a different colour. Furthermore, this instruction stipulates that all

pixels of pixel types 1 and 2 are defined as foreground pixels, and are intended to be displayed in a corresponding different colour. The next instruction SET_CONTR makes the contrast 100% visible for all the

5 pixel types b, p, 1, 2, that is to say all the pixels in the display window for the sub-picture data unit are set to be fully visible. The next instruction SET_DAREA indicates the size of the visible window and defines the location where the window will appear on the

10 screen. In the illustrated example, the top left-hand corner of the visible window is located at the picture coordinates (100, 150), and the bottom right-hand corner is located at the pixel coordinates (117, 159). The next instruction STA_DSP starts the display of the

15 first frame. The next instruction CMD_END indicates the end of the first display control instruction sequence SP_DCSQ0.

The second display control instruction sequence is then processed. The SP_DCSQ_STM instruction now

20 stipulates that the process of outputting a new frame is intended to be displayed in accordance with this display control instruction sequence at the 30th frame after the start of the sub-picture data unit. The next SP_NXT_DCSQ_SA instruction once again refers to the

25 memory address starting from which the next display control instruction sequence SP_DCSQ2 is stored in the memory. This is followed by the next instruction, CHG_COLCON. This instruction is used, within the visible window, to stipulate which pixels are to be

30 included as pixels in the lower picture piece in the combined picture piece, and which are to be included as pixels in the upper picture piece in the combined picture piece. The CHG_COLCON instruction also has 3 successive subsections. These are referred to by the

35 abbreviation LN_CTLI, PX_CTLI and LN_CTLI Termination Code. The code word for the CHG_COLCON instruction consists of just one byte, namely 07H. This is followed by a statement as to how far the CHG_COLCON instruction extends subsequently. The display control instruction

sequence SP_DCSQ1 indicates that there are a further 16 bytes associated with the CHG_COLCON instruction. The CHG_COLCON instruction can be used to change the colour and contrast levels for specific areas within the display window in which the sub-picture is intended to be displayed. The statement LN_CTLI provides the information on how many changes in the colour and contrast levels are intended to be set by the instruction, and the statement N = 1 in the example shown here means that there is only one change. This thus also indicates the area on the screen to which the changes are intended to apply. In the illustrated example, the statement clsn = 2 means that changes are intended to apply starting from the second video line. The statement ctln = 200 defines the fact that the change is intended to apply as far as the 200th video line. In practice, however, the change applies only in the area in the display window of the sub-picture data unit. This was in fact defined in the first display control instruction sequence SPU_DCSQ0 in such a way that it extends from pixel position 100 in video line 150 to pixel position 117 in video line 159. The next information item PX_CTLI0 now indicates that column in the previously defined video line area from which a change to the colour and/or contrast levels is intended to start. The statement cspn = 116 defines that a change is intended to start from the 116th pixel position. The next statement col = 0 1 0 1 defines that the colour level 0 is now intended to be selected for the pixel type b, the colour level 1 is intended to apply to the pixel type p, the colour type 0 is intended to apply to the pixel type 1, and the colour type 1 is intended to apply to the pixel type 2. This is different to the definitions in the first display control instruction sequence. The statement CNTR = F F F F defines that the contrast is set as before for all the pixel types, such that the pixel types are fully visible. With regard to the contrast levels, there is thus no change from the statements in the first display

control instruction sequence. Finally, this is followed by the end code for the CHG_COLCON instruction. This instruction is used to state that there are no further changes to be set from then on. This CHG_COLCON

5   instruction thus means that the evaluation of the combined picture piece in the previously defined display window up to and including column 115 is carried out as stated in the first display control instruction sequence SP_DCSQ0. Starting from column

10 116, the pixels are then intended to be evaluated differently. This means that, starting from column 116, instead of the lower picture piece in the combined picture piece, the bitmap data are evaluated such that the upper picture piece is reproduced. The final

15 instruction SET_DSPXA in the second display control instruction sequence SP_DCSQ1 now sets the pointer to the start of the run-length coding within the PXD area such that evaluation is intended to start for the first field from the address 0005H:, and for the second field

20 from the address 0034H:. Decoding is thus no longer carried out starting from the same address as in the first display control instruction sequence, but, in fact, one byte later in each case. This is equivalent to shifting the letter sequence which is output in the

25 display window by two pixels to the left since, in fact, the run-length code words have each been formed separately for two successive pixels. The data in the PXD field shows how the PXD pointer is moved. Namely, the first byte at the address 0004H: is no longer

30 evaluated. This is then followed by eight data bytes with the value 44H. These are the code words for in each case two successive background pixels. Thus, during decoding, 16 background pixels are output in the first line. This is then followed by the data byte 46H.

35 This data byte, however, in fact corresponds to the first data byte for the third video line, when decoding would be carried out starting from the address 0004H:, where a background pixel and a foreground pixel thus follow one another for the lower picture piece. After

run-length decoding, this then means that a pixel of type b and a further pixel of type 1 must be output here. Since, in accordance with the CHG_COLCON instruction, both of these two types should be regarded

5 as background pixels, two background pixels are thus likewise output at the two pixel positions in columns 116 and 117. It must be remembered that these last two pixels correspond to the first two pixels in the upper picture piece in the combined picture piece. This is

10 due to the fact that the two picture pieces have been moved with respect to one another through two pixels in the vertical direction. This movement thus guarantees that the correct pixels are always joined to one another seamlessly. This analysis is likewise

15 applicable to the output for the second field.

     In the subsequent display control instruction sequences, appropriate measures are now taken to move the running script further. The area starting from which the pixels need to be evaluated differently is

20 successively chosen to be ever larger. In the third display control instruction sequence SP_DCSQ2, the different evaluation starts from column 114. The area moves further and further to the left, by two pixels for each display control instruction sequence. By the

25 ninth display control instruction sequence SP_DCSQ8, this area is so large that the different evaluation actually starts from pixel column 102. Accordingly, the PXD pointer is also moved on by one address per display control instruction sequence. In the ninth display

30 control instruction sequence SP_DCSQ8, this pointer is at the address 000CH: for the first field, and is thus at the last data byte 44H of the first video line.

     In the final display control instruction sequence SP_DCSQ9, the PXD pointer is then no longer

35 moved. There is likewise no further movement of the pixel evaluation with the CHG_COLCON instruction. This display control instruction sequence is used only to end the display of the sub-picture data unit. The STP_DSP instruction is used for this purpose. To make

the lower picture piece completely visible, an additional display control instruction sequence would also have to be provided, so that the implementation of the evaluation starts from the pixel column 100,

5 combined with the PXD pointer being moved to the next data entry.

The described sub-picture data unit thus produces a slow movement of the running script with the letters A, B, C, D, E, F, with an onward movement of

10 virtually two pixels per second. This is due to the fact that a movement takes place only once in 30 video frames. This movement could, of course, be speeded up if the changes were intended to be displayed at shorter intervals.

15 The movement direction for the running script can also be very easily reversed in the same way. In this situation, the PXD pointer would have to be moved in the opposite direction, with the CHG_COLCON instruction being appropriately adapted, so that the

20 area where different evaluation is intended to be carried out is enlarged successively from left to right. In the illustrated example, only a very short running script was produced, for the sake of simplicity. The statements below must now also be

25 observed, for longer running scripts.

For this purpose, reference is made to Figure 8. This shows a longer running script, extending from the letter a to the letter o. Three letters from this running script are in each case always intended to be

30 displayed in the correspondingly selected display window. The entire running script must then be subdivided into areas of equal size by vertical cuts, with each of these areas always including three letters. Two successive parts are then combined with

35 one another and are stored in an associated bitmap in the memory. This is indicated by curved brackets in Figure 8. This results in a first combined picture piece having a corresponding first bitmap. The letters a, b, c and d, e, f are stored combined in this first

bitmap. The letters d, e, f and g, h, i have then been combined in the second combined picture piece, etc. The combined picture pieces can be entered successively in the PXD area of the memory. Once the first combined

5 picture piece with the first bitmap has been completely processed, as explained above, so that only pixels in the second picture piece are visible during movement from right to left, the process of displaying the next combined picture piece is then started. The second

10 bitmap is thus then called up in a following display control instruction sequence. From this point, the procedure is then the same as that for the first two picture pieces. The procedure for the remaining combined picture pieces is analogous, until the final

15 combined picture piece has been processed. The described method also likewise makes it possible to run through horizontally in a varying manner (for example with direction changes, varying movement speeds, etc.) in a simple manner, with appropriately adapted run-

20 length coding.

In the example explained here it has been assumed that the combined picture pieces are stored separately in two fields in the PXD area, and are addressed separately via the SET_DSPXA instruction.

25 However, the method is just as suitable for producing horizontal movement, in which the SET_DSPXA instruction for both fields is set to the same memory address in the PXD area. This method is also used, and is referred to by the term "field repetition".

30 The said coding method for coding a picture sequence can be refined even further. For example, the arrangement of the combined picture pieces can also be optimized. Specifically, in the example shown in Figure 8, for example, when movement takes place from right to

35 left, the picture which is output based on the combined picture piece K1 with the output position shifted all the way to the left matches the picture which is output based on the combined picture piece K2 with the output position shifted entirely to the right, and thus exists

in a redundant form. Thus, if the aim during a transition from one combined picture piece to the next is for the picture likewise to be moved through the defined number of pixels from right to left, then this
5 can be done in such a way that the second combined picture piece is moved through the corresponding number of pixels to the right with respect to the previous picture piece. This is illustrated in Figure 9. In the same way as the picture pieces K2 and K3, and K3 and
10 K4, the combined picture pieces K1 and K2 are each additionally shifted through 8 pixels with respect to one another compared with the illustration in Figure 8. This additionally has the advantage that, in consequence, either fewer combined picture pieces are
15 required overall, and thus less memory is required for the PXD area, or the last combined picture piece contains fewer foreground pixels, which in turn allows the run-length coding to be carried out in a manner which reduces the memory requirement. This is shown in
20 Figure 10.

In the upper part of Figure 10, the picture pieces are combined as shown in Figure 8. Eight combined picture pieces are thus required for all the running script, corresponding to the solid line. In the
25 lower part of Figure 10, the combination process has been carried out as shown in Figure 9. As can be seen, only seven combined picture pieces K1-K7 need be stored. As has also already been explained above, the illustration likewise shows that the last picture piece
30 is filled with background pixels if the last picture piece is not of the same size as the previous picture piece in order that any form of combination is possible at all. This area is represented by dashed lines. This results in unused picture areas in the upper picture
35 piece in the last combined picture piece K7. There is thus no longer any need for special run-length coding for this unused area, that is to say the run-length coding of the unused area can be coded in an entirely normal manner, that is to say purely to minimize the

memory required. The only limitation is that the specific run-length code word "Till-end-of-line" must not be used, since this would result in faulty coding because the PXD pointer is in fact successively moved

5   on ever further, and the line end thus changes continually.

Further reduction in the memory requirement can be achieved if the last lines of an object, for example of a running script, are run-length coded in a simpler

10   manner. This is shown in Figure 11. If the lower lines of the object picture contain only one pixel type (for example only background pixels), then the run-length coding of this area can be greatly simplified. All the last lines with only one pixel type in each field are

15   coded exclusively using the run-length code word "Till-end-of-line". Furthermore, a "Till-end-of-line" code word is also attached to each field. The previously explained method for run-length coding is shown schematically in the upper part of Figure 11. On this

20   basis, all the lines are dealt with in the same way, and associated run-length code words are produced separately for all the details. This also applies to the last lines, even though they contain only background pixels. It can now be seen in the lower part

25   of Figure 11 that the last lines, marked by curved brackets and the reference symbol TEOL, are coded using the code words "Till-end-of-line". No more foreground pixels occur in these lines.

The method according to the invention for

30   coding a picture sequence and, accordingly, the sub-picture data units according to the invention as well, can be used in all those appliances which contain the said sub-picture decoder in accordance with the DVD Standard as a component. These are thus, in particular,

35   DVD appliances including DVD-RAM and DVD-recordable, and possibly also including television receiving appliances such as set-top boxes or, for example, camcorders as well.

Claims

1. Method for coding a picture sequence, in which a picture in each case represents a detail of an object, in which case, when the picture sequence is displayed in a display window on a screen, this gives the viewer the impression that the object is moving horizontally in the display window, **characterized in that** the object picture is broken down into a number of segments (30) of equal size by means of vertical cuts, in that the pixel data of two respective adjacent segments (30) are combined, with a combined pixel being produced in each case from corresponding pixels in the segments to be combined, in such a way that the combined pixel is assigned a unique type (b, p, 1, 2), which corresponds to the distribution of the pixel values in the pair of corresponding pixels, and in that a defined number of combined pixels in each line of the object picture are in each case separately run-length coded, with the defined number of combined pixels corresponding to the number of pixels through which the object picture is moved per movement step in the horizontal direction.

2. Method according to Claim 1, wherein the size of the segments (30) corresponds to the size of the object details to be displayed.

3. Method according to Claim 1, wherein the two respective adjacent segments are shifted through two pixels in the vertical direction with respect to one another before they are combined.

4. Method according to Claim 1, wherein the two respective adjacent segments are shifted through one pixel in the vertical direction with respect to one another before they are combined.

5. Method according to Claim 1, wherein a combined picture piece is moved with respect to the previous and the next picture piece through the number of pixels through which the object is moved per picture in the horizontal direction.

6. Method according to Claim 1, wherein the pixels of the pictures can assume only two values, referred to in the following text as the "on" and "off" values.

7. Method according to Claim 1, wherein the following four different pixel types are provided:

- if the corresponding pixels both have the value "off", then the combined pixel value is allocated the type A;

- if the corresponding pixels both have the value "on", then the combined pixel value is allocated the type B;

- if the pixel in the first picture segment has the value "on" and the pixel in the second of the picture segments to be combined has the value "off", then the combined pixel value is allocated the type C;

- if the pixel in the first of the two picture segments to be combined has the value "off" and the pixel in the second of the two picture segments to be combined has the value "on", then the combined pixel value is allocated the type D.

8. Method according to Claim 1, wherein the picture segments to be combined are combined such that they only partially overlap, and missing pixels outside the overlapping area are assigned the value "off".

9. Sub-picture data unit for use in an electronic appliance, in particular a consumer electronics appliance, wherein the sub-picture data unit contains a picture sequence which has been coded using a method according to Claim 1, having a data area (21) for the pixel values of the pictures in the picture sequence and having an instruction area (22) for displaying control instruction sequences (SP_DCSQ), **characterized in that** the display control instruction sequences (SP_DCSQ) contain an instruction which sets the pointer for the start address of the run-length decoding in each case such that the run-length decoding then starts at different pixels in the object picture, in such a way that, in comparison to the previous run-

length decoding, the start of the run-length decoding
is shifted through as many pixels to the right or left
as the object picture is intended to be shifted in
accordance with the desired movement, and in that the
5   display control instruction sequences contain an
instruction which defines the way in which the combined
pixels of a combined picture piece are to be evaluated
in associated areas.

10.   Sub-picture data units according to Claim 9,
10   wherein the sub-picture data unit is designed for use
in a DVD appliance.

11.   Sub-picture data unit according to Claim 10,
wherein the display control instruction sequences
(SP_DCSQ) contain the display control instruction
15   SET_DSPXA defined in the DVD standard in order to shift
the run-length decoding pointer.

12.   Sub-picture data unit according to Claim 10,
wherein each of the pixel types A, B, C, D defined in
Claim 6 is assigned in a mathematically unique manner
20   one of the pixel types (defined in the DVD Standard)
"Background Pixel", "Pattern Pixel", "Emphasis-1 Pixel"
and "Emphasis-2 Pixel".

13.   Sub-picture data unit according to Claim 10,
wherein the display control instruction SET_COLOR or
25   CHG_COLCON is used in a display control instruction
sequence (SP_DCSQT) in order to define the way in which
the combined pixels of a combined picture piece are to
be evaluated in associated areas.

14.   Data storage medium, in particular a DVD
30   disk, having a sub-picture data unit according to Claim
9.

Abstract of the Disclosure

The DVD Standard specifies how, for example, subtitles can be overlaid on a video picture in a simple way. According to this Standard, in each case one so-called sub-picture data unit must be provided on a DVD disk per overlay. The DVD Standard does not contain any information as to how horizontally moving objects can also be displayed in a display window using such sub-picture data units, for example to provide a running script. The aim of the invention is to make it possible to produce horizontally moving objects such as running scripts, using the rules and instructions specified in the DVD Standard, while optimizing the memory requirement. The invention achieves the object by using a specific type of run-length coding in conjunction with a special way of combining object picture segments. The invention relates to a corresponding method for coding a picture sequence, and a corresponding sub-picture data unit as well as a data storage medium.

Figure 3

10

c d e f g h i j k l m n o p q r s t u v

11

Fig.1

20   21   22

| SPUH | PXD | SP_DCSQT |

Fig.2

Fig.3

b	b	b	b	b	b	b	b	b	
b	1	1	b	b	1	1	b	b	
b	1	1	b	b	1	1	b	b	
b	1	1	1	p	1	1	b	b	
b	1	1	2	b	p	1	b	b	
b	1	p	b	b	1	p	b	b	
b	b	2	2	2	2	2	b	b	
b	b	2	b	b	b	2	b	b	
b	b	b	b	b	b	b	b	b	
b	b	b	b	b	b	b	b	b	

20H	44H	19H	11H	10H

b	b	b	b	b	b	b	b	b	b	p	p	p	p	p	p	p	p	p	p	b	b	b	b	b	b	p	·	·	·

28H	29H	18H

Fig.4

| b | b | b | b | b | b | b | b | b | b | p | p | p | p | p | p | p | p | p | p | b | b | b | b | b | b | p | · | · | · |

20H   44H   19H   11H   10H   44H · · ·

· · · | · · · SET_DSPXA · · · | · · · SET_DSPXA · · · | · · · SET_DSPXA · · · | · · ·

Fig.5

1. BST   +   2. BST   =   k. BST
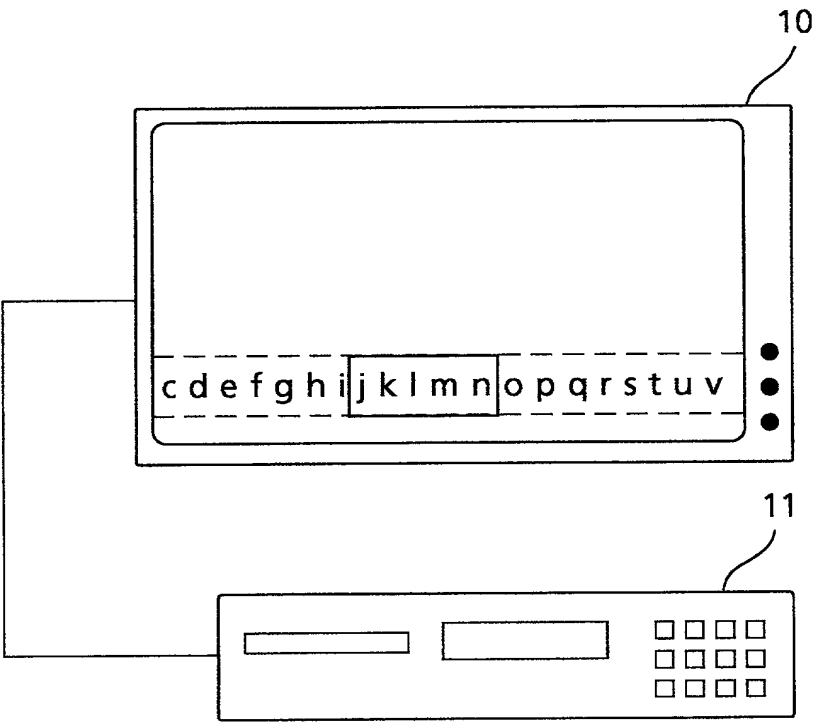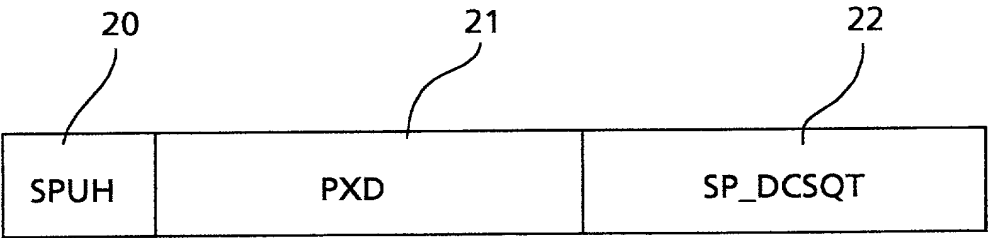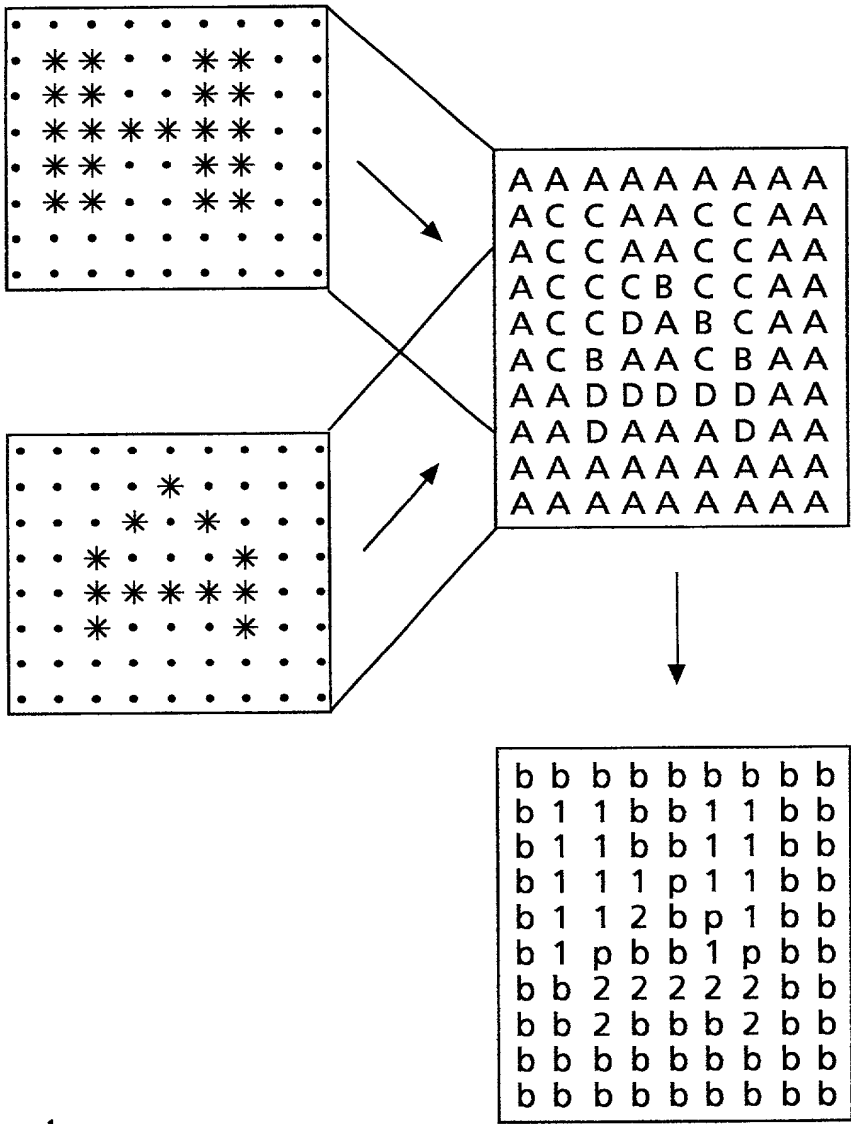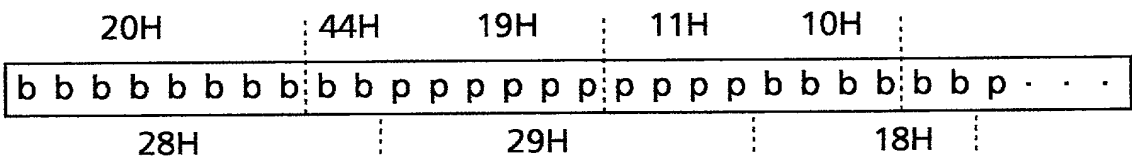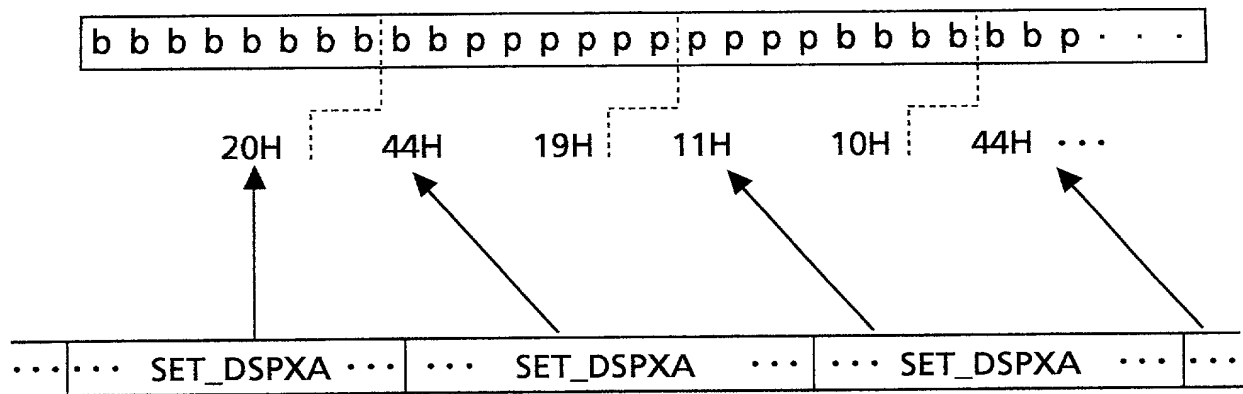
Fig.6

Fig.8

Fig.9

```
0000: ###################### SPUH:
0000: 01 F C                #  SPDSZ      = 508 = 0x1FC
0002: 00 F E                #  SP_DCSQTA  = 254 = 0x FE

0004: ###################### PXD:
0004: 44 44 44 44 44 44 44 44  44 46 46 44 64 44 64 64
0014: 44 44 74 45 64 76 66 44  74 44 44 74 44 74 75 55
0024: 64 75 55 44 54 45 44 54  44 44 54 44 44 00 00 44
0034: 64 44 66 66 44 46 66 64  75 54 64 75 55 74 75 55
0044: 54 76 66 74 74 44 64 74  44 44 74 44 74 76 66 44
0054: 56 66 64 55 54 44 55 55  54 54 44 44 00 00 00 00
0064: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
0074: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
0084: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
0094: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00A4: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00B4: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00C4: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00D4: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00E4: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00F4: 00 00 00 00 00 00 00 00  00 00

00FE: ###################### SP_DCSQT:
00FE: ###################### SP_DCSQ 0 = 0x0
00FE: 00 00                 #  SP_DCSQ_STM = 0s => start frame: 0
0100: 01 16                 #  SP:NXT_DCSQ_SA = 278 = 0x116
0102: 06 00 04 00 33        #  SET_DSPXA uf=0x4 bf=0x33
0107: 03 11 00              #  SET_COLOR b=0 p=0 e1=1 e2=1
010A: 04 FF FF              #  SET_CONTR (0..15) b=15 p=15 e1=15 e2=15
010D: 05 06 40 75 09 60 9F  #  SET_DAREA sx=100 ex=117 sy=150 ey=159
0114: 01                    #  STA_DSP
0115: FF                    #  CMD_END
0116: ###################### SP_DCSQ 1 = 0x1
0116: 00 57                 #  SP_DCSQ_STM => start frame: 30
0118: 01 31                 #  SP_NXT_DCSQ_SA = 305 = 0x131
011A: 07 00 10              #  CHG_COLCON (Extended field size = 16 = 0x10)
011D: 00 02 10 C8           #   LN_CTLI 0: n=1 csln=2 ctln=200
0121: 00 74 10 10 FF FF     #    PX_CTLI 0: cspn=116 col= 0 1 0 1 cntr=F F F F
0127: 0F FF FF FF           #   LN_CTLI Termination Code
012B: 06 00 05 00 34        #  SET_DSPXA uf=0x5 bf=0x34
0130: FF                    #  CMD_END
0131: ###################### SP_DCSQ 2 = 0x2
0131: 00 AF                 #  SP_DCSQ_STM => start frame: 60
0133: 01 4C                 #  SP_NXT_DCSQ_SA = 332 = 0x14C
0135: 07 00 10              #  CHG_COLON (Extended field size = 16 = 0x10)
0138: 00 02 10 C8           #   LN_CTLI 0: n=1 csln=2 ctln=200
013C: 00 72 10 10 FF FF     #    PX_CTLI 0: cspn=114 col= 0 1 0 1 cntr=F F F F
0142: 0F FF FF FF           #   LN_CTLI Termination Code
0146: 06 00 06 00 35        #  SET_DSPXA uf=0x6 bf=0x35
014B: FF                    #  CMD_END
014C: ###################### SP_DCSQ 3 = 0x3
014C: 01 07                 #  SP_DCSQ_STM => start frame: 90
014E: 01 67                 #  SP_NXT_DCSQ_SA = 359 = 0x167
0150: 07 00 10              #  CHG_COLCON (Extended field size = 16 = 0x10)
0153: 00 02 10 C8           #   LN_CTLI 0: n=1 csln=2 ctln=200
0157: 00 70 10 10 FF FF     #    PX_CTLI 0: cspn=112 col= 0 1 0 1 cntr=F F F F
015D: 0F FF FF FF           #   LN_CTLI Termination Code
0161: 06 00 07 00 36        #  SET_DSPXA uf=0x7 bf=0x36
0166: FF                    #  CMD_END
```
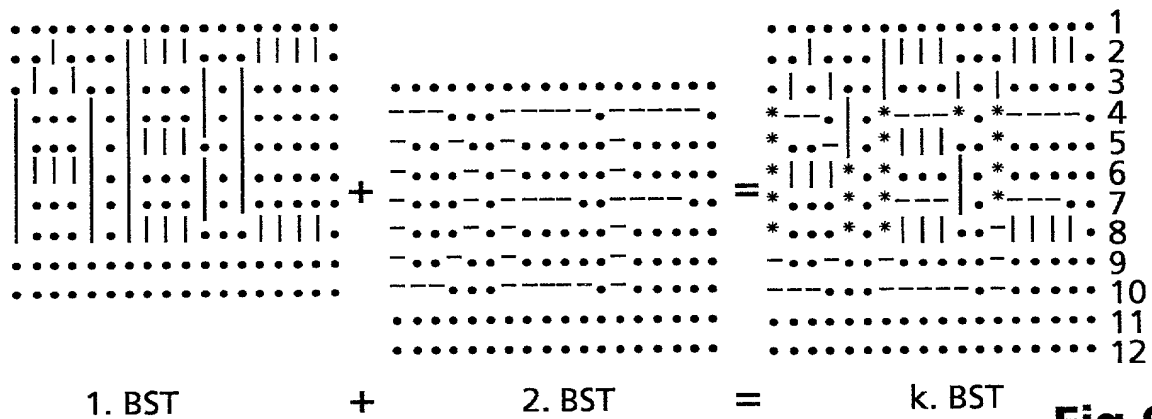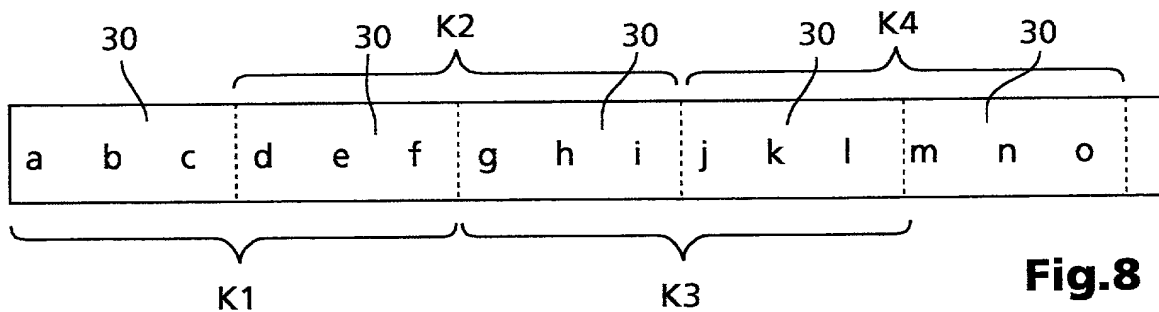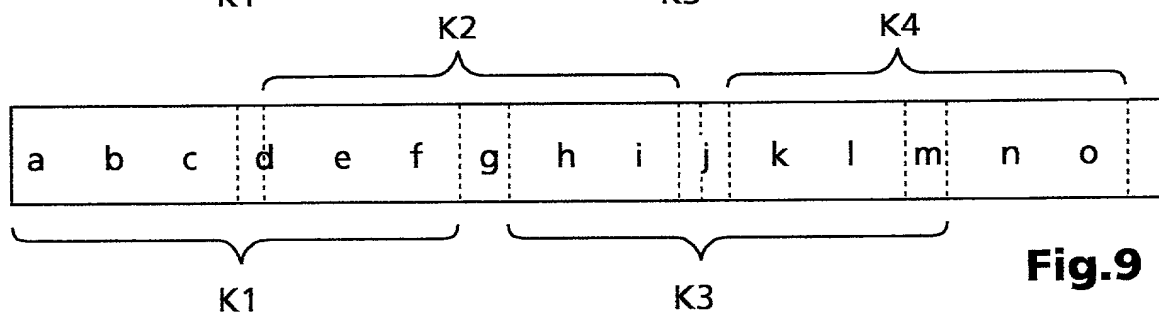
```
0167:####################    SP_DCSQ 4 = 0x4
0167:01 5F                #  SP_DCSQ_STM => start frame: 120
0169:01 82                #  SP_NXT_DCSQ_SA = 386 = 0x182
016B 07 00 10             #  CHG_COLON (Extended field size = 16 = 0x10)
016E:00 02 10 C8          #    LN_CTLI 0:   n=1 csln=2 ctln=200
0172:00 6E 10 10 FF FF    #    PX_CTLI 0: cspn=110 col= 0 1 0 1 cntr=F F F F
0178:0F FF FF FF          #   LN_CTLI Termination Code
017C:06 00 08 00 37       #  SET_DSPXA uf=0x8 bf=0x37
0181:FF                   #  CMD_END
0182:####################    SP_DCSQ 5 = 0x5
0182:01 B7                #  SP_DCSQ_STM => start frame: 150
0184:01 9D                #  SP_NXT_DCSQ_SA = 413 = 0x19D
0186:07 00 10             #  CHG_COLCON (Extended field size = 16 = 0x10)
0189:00 02 10 C8          #    LN_CTLI 0: n=1 csln=2 ctln=200
018D:00 6C 10 10 FF FF    #    PX_CTLI 0:   cspn=108 col= 0 1 0 1 cntr=F F F F

0193:0F FF FF FF          #    LN_CTLI Termination Code
0197:06 00 09 00 38       #  SET_DSPXA uf=0x9 bf=0x38
019C:FF                   #  CMD_END
019D:####################    SP_DCSQ 6 = 0x6
019D:02 0F                #  SP_DCSQ_STM =>   start frame: 180
019F 01 B8                #  SP_NXT_DCSQ_SA = 440 = 0x1B8
01A1:07 00 10             #  CHG_COLCON (Extended field size = 16 = 0x10)
01A4:00 02 10 C8          #    LN_CTLI 0: n=1 csln=2 ctln=200
01A8:00 6A 10 10 FF FF    #    PX_CTLI 0: cspn=106 col= 0 1 0 1 cntr=F F F F
01AE:0F FF FF FF          #    LN_CTLI Termination Code
01B2:06 00 0A 00 39       #  SET_DSPXA uf=0xA bf = 0x39
01B7:FF                   #  CMD_END
01B8:####################    SP_DCSQ 7 = 0x7
01B8:02 67                #  SP_DCSQ_STM => start frame: 210
01BA:01 D3                #  SP_NXT_DCSQ_SA = 467 = 0x1D3
01BC:07 00 10             #  CHG_COLON (Extended field size = 16 = 0x10)
01BF:00 02 10 C8          #    LN_CTLI 0 : n=1 csln=2 ctln=200
01C3:00 68 10 10 FF FF    #    PX_CTLI 0: cspn=104 col= 0 1 0 1 cntr=F F F F
01C9:0F FF FF FF          #    LN_CTLI Termination Code
01CD:06 00 0B 00 3A       #  SET_DSPXA uf=0xB bf=0x3A
01D2:FF                   #  CMD_END
01D3:####################    SP_DCSQ 8 = 0x8
01D3:02 BF                #  SP_DCSQ_STM => start frame: 240
01D5:01 EE                #  SP_NXT_DCSQ_SA = 494 = 0x1EE
01D7:07 00 10             #  CHG_COLCON (Extended field size = 16 = 0x10)
01DA:00 02 10 C8          #    LN_CTLI 0: n=1 csln=2 ctln=200
01DE:00 66 10 10 FF FF    #    PX_CTLI 0: cspn=102 col= 0 1 0 1 cntr=F F F F
01E4:0F FF FF FF          #    LN_CTLI Termination Code
01E8:06 00 0C 00 3B       #  SET_DSPXA uf=0xC bf=0x3B
01ED:FF                   #  CMD_END
01EE:####################    SP_DCSQ 9 = 0x9
01EE:03 17                #  SP_DCSQ_STM => start frame: 270
01F0:01 EE                #  SP_NXT_DCSQ_SA = 494 = 0x1EE
01F2:07 00 06             #  CHG_COLON (Extended field size = 6 = 0x6)
01F5:0F FF FF FF          #    LN_CTLI Termination Code
01F9:02                   #  STP_DSP
01FA:FF                   #  CMD_END
01FB:FF                   #  Stuffing Byte => even SP size
```
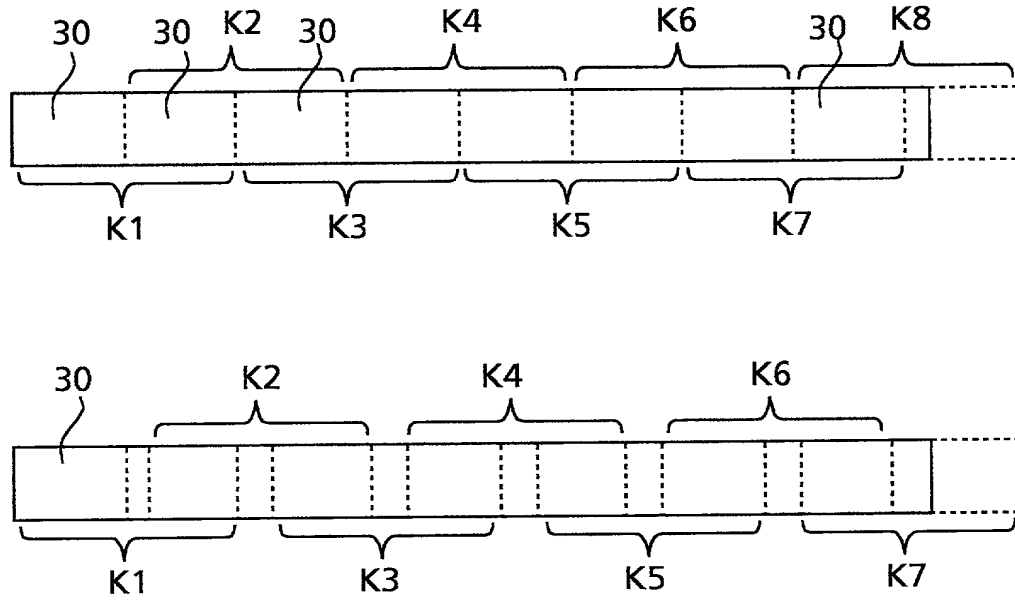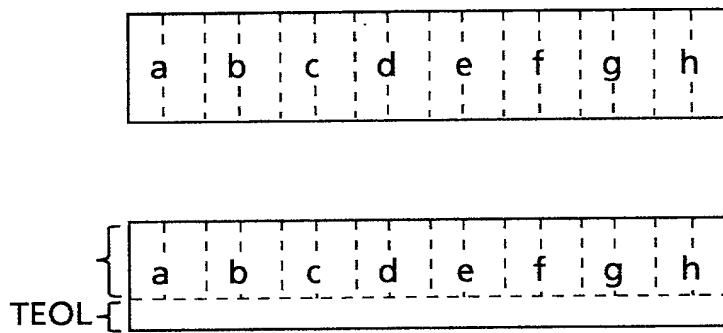
Fig.7

Fig.10

Fig.11

PD990062

DECLARATION FOR UNITED STATES PATENT APPLICATION, POWER OF ATTORNEY, DESIGNATION OF CORRESPONDENCE ADDRESS

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD FOR CODING A PICTURE SEQUENCE, AS WELL AS A SUB-PICTURE UNIT FOR USE IN AN ELECTRONIC APPLIANCE, AND A DATA STORAGE MEDIUM

the specification of which
(CHECK ONE)   (xx)   is attached hereto.
                ( )   was filed on   , Application Serial. No.
                         and was amended on .

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent, utility model, design or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
Number	Country	Date Filed	Yes	No
199 50 490.3	DE	October 20, 1999	xx	

I hereby claim the benefit under 35 USC 120 of any US Application(s) listed below, and, insofar as the subject matter of each of the claims of this Application is not disclosed in the prior US application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

Serial No.:   Filed:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under of 18 USC 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Joseph S. Tripoli (Reg. No. 26,040), Eric Herrmann (Reg. No. 29,169) and Joseph J. Laks (Reg. No. 27,914) Telephone: (609) 734-9813.

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